CLAIMS

1. An image reading apparatus for processing image data outputted from an image sensor, said apparatus comprising:

contour detecting means for detecting a pixel with the quantity of change in density higher than a threshold value as probable edge point thought to be a document edge point, and

contour correction means for recognizing the document edge point indicating the position of the document edge on the basis of the position of said probable edge point.

2. The image reading apparatus of claim 1 wherein said contour detecting means is provided with density change calculating means for working out the quantity of change in density on the basis of the image density of the pixels around an object pixel.

3. The image reading apparatus of claim 2 contour detecting means is provided with judgement means for detecting an object pixel as said probable edge point if the values of the respective pixels are identical when the densities of a specific number of consecutive pixels either in the direction of scanning or opposite direction of scanning are binarized on a specific slice level.

4. The image reading apparatus of claim 3 wherein when the respective reading lines are scanned in a specific direction and the density values of a specific number of consecutive pixels in the opposite direction of scanning from said probable edge point are binarized on a specific slice level, judgement means recognizes said probable edge point of which the values of the respective pixels are identical and judge as first probable

edge point the probable edge point first recognized out of said recognized probable edge points, and

wherein when the respective reading lines are scanned in a specific direction and the density values of a specific number of consecutive pixels in the direction of scanning from said probable edge point are binarized on a specific slice level, said judgement means recognizes said probable edge point of which the values for the respective pixels are identical and judge as second probable edge point the probable edge point first recognized out of said recognized probable edge points.

5. The image reading apparatus of claim 3 wherein when the densities of a specific number of consecutive pixels either in the scanning direction or the opposite direction of scanning from an object pixel are binarized on a specific slice level in an object image of which the density change quantity is regarded by said density change calculating means as less than said threshold value and not lower than the second threshold value which is less than said threshold value and in case the values of the respective pixels after binarization are identical, judgement means detects said pixels as tentative probable edge points.

6. The image reading apparatus of claim 5 wherein, when the respective reading lines are scanned in a specific direction and the density values of a specific number of consecutive pixels in the opposite direction of scanning from said tentative probable edge point are binarized on a specific slice level, judgement means perceives said tentative probable edge point of which the values of the respective pixels after binarization are identical and judge as first tentative probable edge point the tentative probable edge point first recognized out of said recognized tentative

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probable edge points, and

when the respective reading lines are scanned in a specific direction and the density values of a specific number of consecutive pixels in the direction of scanning from said tentative probable edge point are binarized on a specific slice level, said judgement means perceives said tentative probable edge point of which the values of the respective pixels after binarization are identical and judge as second tentative probable edge point the probable edge point last perceived out of said tentative perceived probable edge points, and at the same time,

when said second probable edge point is not detected on the reading line to which said first tentative probable edge point belongs, said judgement means regards said first tentative probable edge point as first probable edge point, and

when said first probable edge point is not detected on the reading line to which said second tentative probable edge point belongs, said judgement means regards said second tentative probable edge point as said second probable edge point.

7. The image reading apparatus of claim 1 wherein said contour correction means determines as permissible scope a scope of a specific distance in the reading line direction from straight line passing said two probable edge points a specific number of reading lines apart from each other, and recognizes said probable edge points present in said permissible scope as said document edge points.

8. The image reading apparatus of claim 1 wherein said contour correction means determines as permissible scope a scope of a specific distance in the reading line direction from a probable edge point detected

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on the reading line a specific number of reading lines apart from the object probable edge point, and recognizes said probable edge point as document edge point when said object probable edge point is present in said permissible scope.

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9. The image reading apparatus of claim 1 wherein said contour correction means works out the gradients of a first permissible scope-setting straight line passing the object probable edge point out of the permissible scope-setting straight lines passing two probable edge points a specific number of reading lines apart from each other, a second permissible scope-setting straight line passing said probable edge point detected on the second reading line one or a plurality of lines apart from the reading line to which said object probable edge point belongs, and a third permissible scope-setting straight line passing said probable edge point detected on the third reading line one or a plurality of lines apart from the reading line to which said object probable edge point belongs,

determines a permissible scope on the basis of a gradient difference value between the second straight line and the first straight line and a gradient difference value between the third straight line and the second straight line, and

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in case the object probable edge point is present in the permissible scope, recognizes said object probable edge point as said document edge point.

25   10. The image reading apparatus of claim 1 wherein in a reading line where said document edge point is not recognized, said contour correction means recognizes a specific pixel belonging to said reading line as document edge point on the basis of document edge points recognized on

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other reading lines.

11. The image reading apparatus of claim 10 wherein said contour correction means recognizes as document edge point the pixel located at the intersection point between straight line passing a document edge point recognized on one or a plurality of other reading lines and an object reading line .

12. The image reading apparatus of claim 1 wherein said contour correction means acquires positional information on said probable edge point by scanning image data in one or a plurality of directions, said image data outputted from said image sensor, and recognizes document edge point on the basis of positional information acquired by scanning in different directions.

13. The image reading apparatus of claim 12 wherein when said probable edge point is not detected on a specific number of consecutive reading lines counted from the object reading line in a specific direction where said probable edge point is detected, said contour correction means scans the image data in an opposite direction, said image data outputted from said image sensor.

14. The image reading apparatus of claim 13 wherein said contour correction means recognizes as said document edge point the pixel located at the intersection point between the object reading line and straight line passing one or a plurality of said document edge points recognized by scanning in a specific direction or straight line passing one or a plurality of said document edge points recognized by scanning in the other

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direction.

15. The image reading apparatus of claim 1 which comprises thinning out means for recognizing a representative value on the basis of positional information on said probable edge point detected on one or a plurality of reading lines and

contour correction means for recognizing the document edge point on the basis of said representative value.

16. The image reading apparatus of claim 15 wherein said representative value is a middle point between said two probable edge points.

17. The image reading apparatus of claim 1 which is provided with signal generating means for generating effective width signals indicating the document contour on the basis of said document edge point and

image forming means for generating an image within the document contour on the basis of image data outputted from said image sensor and said effective width signals.

18. The image reading apparatus of claim 1 which is provided with output substitution means for detecting the outside of the document contour of image data outputted from said image sensor on the basis of said document edge point, substituting the image data outside said document contour with a white image and outputting the data.

19. The image reading apparatus of claim 1 which is provided with image data substituting means for detecting the outside of the document

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contour of image data on the basis of said document edge point, said image data stored in image memory for storing image data outputted from said image sensor, and substituting the image data outside said document contour with a white image.

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20. The image reading apparatus of claim 1 which is provided with document image reading means for detecting the document contour of image data on the basis of said document edge points, said image data stored in said image memory, and outputting the image data within said detected document image contour only.

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21. The image reading apparatus of claim 1 which is provided with closing and opening detection means for detecting a document cover to prevent light from reaching said image sensor from outside and the opening and closing of said document cover and, in case the document cover is opened, actuates said contour detecting means.

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22. A processing apparatus for processing image data which comprises:

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contour detecting means for detecting a pixel as probable edge point thought to be a document edge point, said pixel having a higher quantify of change in density than the threshold value, and

contour correction means for recognizing a document edge point indicating the position of the document edge on the basis of the position of said probable edge point.

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